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Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L45	L44 and servers	28	L45
L44	L43 and workstations	30	L44
L43	l34 and (I/O driver or on/off driver)	141	L43
DB=USPT; PLUR=YES; OP=OR			
L42	5828876.pn.	1	L42
L41	5828876.pn.	1	L41
L40	5832222.pn.	1	L40
L39	5832222.pn.	1	L39
L38	5889520.pn.	1	L38
L37	5893086.pn.	1	L37
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L36	L34 and (policy or polic$) and protocol	31	L36
L35	L34 and (policy or polic$) near protocol	3	L35
L34	L32 and stor$ near node	153	L34
L33	L32 and shared near stor$ near node	8	L33
L32	L31 and (network or internet or www)	2006	L32

L31	(mirror$ or shadow$) near data	3677	L31
L30	370/417	483	L30
L29	370.clas.	82251	L29
L28	714/6	2652	L28
L27	714/4	2437	L27
L26	714.clas.	48219	L26
L25	707/104.1	5274	L25
L24	707/10	9752	L24
L23	707/9	2423	L23
L22	707/8	2188	L22
L21	707/1	6938	L21
L20	707.clas.	25375	L20
L19	711/147	1929	L19
L18	711/114	2648	L18
L17	711/111	1436	L17
L16	711.clas.	24509	L16
L15	709/232	2287	L15
L14	709/229	4553	L14
L13	709/227	4791	L13
L12	709/224	6818	L12
L11	709/212	730	L11
L10	709/217	6435	L10
L9	709/216	966	L9
L8	709/200	3343	L8
L7	709/201	4191	L7
L6	709/204	2480	L6
L5	709/203	8897	L5
L4	709/214	666	L4
L3	709/213	1947	L3
L2	709/219	5999	L2
L1	709.clas.	34731	L1

END OF SEARCH HISTORY

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Search History

DATE: Saturday, March 05, 2005 Printable Copy Create Case

Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR		
L19	L18 and (mirror$ or shadow$)	68	L19
L18	l1 and backup and restore	109	L18
	DB=USPT; PLUR=YES; OP=OR		
L17	5519844.pn.	1	L17
L16	5519844.pn.	1	L16
L15	5659704.pn.	1	L15
L14	5659704.pn.	1	L14
L13	4414644.pn.	1	L13
L12	4533995.pn.	1	L12
L11	5673382.pn.	1	L11
L10	5673382.pn.	1	L10
L9	5829046.pn.	1	L9
L8	5857208.pn.	1	L8
L7	5857208.pn.	1	L7
L6	5875478.pn.	1	L6

L5	6023281.pn.	1	L5
L4	6076148.pn.	1	L4
L3	5991793.pn.	1	L3
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L2	L1 and (mirror$ or shadow$) near data	91	L2
L1	virtual near (stor$ or storage) and area and (network or www or internet)	1486	L1

END OF SEARCH HISTORY

L34: Entry 149 of 153 File: USPT Oct 14, 1997

US-PAT-NO: 5678061
DOCUMENT-IDENTIFIER: US 5678061 A

TITLE: Method for employing doubly striped mirroring of data and reassigning data streams scheduled to be supplied by failed disk to respective ones of remaining disks

DATE-ISSUED: October 14, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
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APPL-NO: 08/ 504096 [PALM]
DATE FILED: July 19, 1995

INT-CL: [06] G06 F 15/02

US-CL-ISSUED: 395/841; 395/182.04, 395/405
US-CL-CURRENT: 710/21; 711/5, 714/6

FIELD-OF-SEARCH: 395/182.04, 395/182.05, 395/441, 395/439, 395/489, 395/841, 395/405, 395/497.04, 395/800, 395/842, 395/182.03, 371/40.4

PRIOR-ART-DISCLOSED:

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PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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4796098	January 1989	Giddings	386/47
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ART-UNIT: 237

PRIMARY-EXAMINER: Meky; Moustafa M.

ATTY-AGENT-FIRM: Luludis; F. B.

ABSTRACT:

The reliability of supplying data stored in a plurality of different memories to different users is enhanced by (a) dividing each of the memories into primary and secondary sections, (b) partitioning the data into successive blocks and (c) storing the blocks of data in sequence in respective ones of the primary sections. Then storing in sequence the blocks of data that have been stored in the primary section of one of the memories in respective ones of the secondary sections of the other ones of said disks.

2 Claims, 8 Drawing figures

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L34: Entry 149 of 153 File: USPT Oct 14, 1997

DOCUMENT-IDENTIFIER: US 5678061 A
TITLE: Method for employing doubly striped mirroring of data and reassigning data streams scheduled to be supplied by failed disk to respective ones of remaining disks

Drawing Description Text (5):
FIG. 3 illustrates a schedule that a storage node of FIG. 1 may create for the unloading of data blocks stored in an associated disk;

Detailed Description Text (3):
With that in mind, in an illustrative embodiment of the invention, multiplexer 75, FIG. 1, which may be, for example, an Asynchronous Transport Mode switch, receives data in the form of packets from storage nodes 50-1 through 50-N, respectively. Multiplexer 75 then routes the received packets over respective virtual circuit connections via communications paths 75-1 through 75-N to their intended destinations, in which a packet may carry a segment of a video program and in which the content of the video program may be doubly striped and mirrored in accord with the invention across storage disks 40-11 through 40-j4, as will be explained below in detail. Because of such striping, a storage node 50i may supply a packet carrying a respective portion of a segment of a particular video program to multiplexer 75 via a virtual channel assigned to the segments that are stored in storage disks 40k associated with storage node 50i and that are to be delivered to the same destination (subscriber), where N, j, i and k>1. Thus, segments of the content of a video program striped across the storage disks may be supplied to multiplexer 75 via respective ones of a number of different virtual data channels assigned for that purpose. Once such contents have been so delivered, then the assigned virtual data channels may be reassigned for some other but similar purpose (or left idle).

Detailed Description Text (5):
Processor 25, more particularly, first determines if it has the resources available to service the request. That is, if a disk is able to support n data streams and the content of a program is striped over N disks, then nN streams (users) can be supported from the array of N disks, where n and N>1. Thus, server 100 may service the user's request if the current number of data streams that are being supplied by the array of disks 40-11 through 40-j4 to multiplexer 75 is less than nd. Assuming that is the case, then processor 25 communicates with multiplexer 75 to obtain channel assignments that the storage nodes may use to sequentially transmit their respective video segments that form the requested video to multiplexer 75. Included in such communication is a request to establish a virtual connection between each of the assigned channels and a channel of one of the communications paths 76-1 through 76-N that will be used to route the program to the user. In addition, processor 25 establishes a schedule that the storage nodes 50i are to follow in the delivery of the segments to the user via multiplexer 75. Processor 25 then supplies the assigned channels and schedule to each of the storage nodes 50i via Local Area Network (LAN) 30, as discussed below. The schedule includes the identity of the storage node, e.g., 50-1, and associated disk, e.g., disk 40-11, storing the initial (first) segment of the requested program. The schedule also includes the time of day that the first segment of the program is to be unloaded from disk and supplied to multiplexer 75. Processor 25 then forms a message containing, inter

alia, the (a) schedule established for running the program, (b) identity of the program, (c) identity of the storage node containing the first segment of the program, (d) channel that has been assigned to the node whose address is contained in the header of the message, and (e) time of day that the first segment is to be transmitted to the user. Processor 25 then sends the message to the storage node identified in the message via LAN 30. Processor 25 then updates the message so that it is applicable to a next one of the storage nodes and sends the message to that node via LAN 30. In an illustrative embodiment of the invention, processor 25 sends the message first to the storage node 50i containing the first segment of the requested program. Processor 25 sequentially sends the message to the remaining storage nodes based on the order of their respective addresses and updates the message following each such transmission.

Detailed Description Text (6):
Since the storage nodes 50i are similar to one another, a discussion of one such node equally pertains to the other storage nodes. It is thus seen that storage node 50-1, FIG. 1, includes microprocessor 52-3 for communicating with host 25, in which the communications are typically directed to setting up a schedule for the delivery of respective video segments stored in buffer 52-2 to multiplexer 75 via the assigned data channel and for controlling the storing and unloading of the segments from buffer 52-2. Buffer 52-2 represents a dual buffer arrangement in which microprocessor 52-3 unloads segments of video from respective ones of the disks 40-11 through 40-14 and stores the unloaded segments in a first one of the dual buffers 52-2 during a first cycle. During that same cycle, e.g., a time period of one second, microprocessor 52-3 in turn unloads portions of respective segments of respective videos stored in the second one of the dual buffers 52-2 during a previous cycle. Adapter 52-1 reads a packet from the buffer and transmits the packet to multiplexer 75 via communication path 51-1 (which may be, e.g., optical fiber) and the channel assigned for that particular purpose. OC3 adapter 52-1 implements the well-known OC3 protocol for interfacing a data terminal, e.g., storage node 50-1, with an optical fiber communications path, e.g., path 51-1. SCSI adapter 52-4, on the other hand, implements a Small Computer System Interface between microprocessor 52-3 and its associated disks 40-11 through 40-14 via bus 45-1.

Detailed Description Text (9):
For the sake of simplicity and clarity, only disks 65-1 through 65-4 of a server 60, FIG. 2, are shown. (The other elements of the server 60, e.g., storage node, host processor, etc., are not shown.) Assume that the host processor has divided a video program into a plurality of sequential data blocks (segments) D0 through Di for storage in the disks, in accord with the invention. To do so, the host processor stores the data blocks D0 through Di in sequential order (i.e., round-robin order) in the primary sections P of disks 65-1 through 65-4, respectively, as shown in FIG. 2. That is, the host processor stripes the data blocks across the primary sections of disks 65-1 through 65-4. The host processor then makes a backup copy of the contents of the primary sections of the disks 65i, for example, 65-1. It does this, in accord with an aspect of the invention, by striping the data blocks forming such contents across the secondary sections of the other disks, i.e., disks 65-2 through 65-4, in round-robin order. For example, it is seen from FIG. 2 that the first three data blocks D0, D4 and D8 stored in disk 65-1 are also stored in the secondary (backup) sections S of disks 65-2 through 65-4, respectively. This is also the case for data blocks D12, D16 and D20 as well as the remaining contents of the primary section of disk 65-1. Similarly, the contents of the primary section of disk 65-2 are striped across disks 65-3, 65-4 and 65-1 in that order. For example, it is also seen from FIG. 2 that data blocks D1, D5 and D9 of the primary section of disk 65-2 are striped across disks 65-3, 65-4 and 65-1, respectively, and so on. Such backup striping is shown for the contents of the primary sections of disks 65-3 and 65-4.

Detailed Description Text (11):

Assume at this point that the host processor has received a request for the video program from a user and the host has communicated that request to each of the storage nodes 60-1 through 60-4 with the indication that the start of the program block D0 is to be delivered at time t0. Further assume that a cycle is one second and a block of data is three (3) megabits. Upon receipt of the request, node 60-1 generates a schedule for the unloading of the blocks of the program that are stored in associated disk 65-1 and stores the schedule in internal memory (not shown). The schedule so generated starts with the unloading of block D0 at time t0 minus 1 second for delivery to the associated server 300 multiplexer at time t0. The next entry, D4 is scheduled to be unloaded at time t0 plus 3 seconds for delivery at t0 plus 4 seconds. The next entry D8 is scheduled to be unloaded at time t0 plus 7 seconds for delivery at t0 plus 8 seconds, and so on. An illustrative example of such a schedule is shown in FIG. 3.

Detailed Description Text (12):
Storage node 60-2 generates a similar schedule with respect to data blocks D1, D5, D9, etc. That is, a storage node is programmed so that it determines its order in delivering the sequence of data blocks 35 forming the requested program to the associated multiplexer as a function of the identity of the node 60i having the first block of such data. Accordingly, the schedule that node 60-2 generates will indicate that data block D1, D5, D9, etc., are to be respectively delivered during cycles t0+1, t0+5, t0+9, and so on. Similarly, storage nodes 60-3 and 60-4 generate their own delivery schedules with respect to the data blocks of the requested program that are stored in their associated disks.

Detailed Description Text (16):
If the program exits block 405 via the `no` path, then it increments (block 407) the number of data streams in batch i and sets a variable m to the address of node j. The program then assigns the user's request to batch i for transmission via bus m and the appropriate storage node 50m. The program (block 409) then sets C=(i+1) mod N and sets m=(m+1) mod N. The program (block 410) then determines if m=j and exits if that is the case. Otherwise, the program returns to block 408.

L34: Entry 150 of 153 File: USPT Jan 30, 1996

US-PAT-NO: 5488731
DOCUMENT-IDENTIFIER: US 5488731 A

TITLE: Synchronization method for loosely coupled arrays of redundant disk drives

DATE-ISSUED: January 30, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mendelsohn; Noah	Arlington	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
International Business Machines Corporation	Armonk	NY			02

APPL-NO: 08/ 352428 [PALM]
DATE FILED: December 8, 1994

PARENT-CASE:
This is a continuation of application Ser. No. 07/924,219 filed on Aug. 3, 1992, now abandoned.

INT-CL: [06] G06 F 11/00

US-CL-ISSUED: 395/800; 371/49.1, 371/47.1, 395/182.04, 395/182.12, 395/182.22
US-CL-CURRENT: 711/114; 714/14, 714/24, 714/6, 714/800

FIELD-OF-SEARCH: 395/800, 395/575, 364/DIG.1, 371/66, 371/51, 371/13, 371/49.1, 371/68.1

PRIOR-ART-DISCLOSED:

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Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
WO90/06550	June 1990	WO	

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ART-UNIT: 232

PRIMARY-EXAMINER: Bowler; Alyssa H.

ASSISTANT-EXAMINER: Davis, Jr.; Walter D.

ATTY-AGENT-FIRM: Perman & Green

ABSTRACT:

A multiprocessor system includes a plurality of substantially identical nodes interconnected through a switching network, each node including a disk drive, NVRAM, and a processor. The system stores data in either a RAID or mirrored fashion across a plurality of disk drives in different nodes. When data is stored in a RAID arrangement, an NVRAM in a parity node is provided with an entry including the new data, a copy of old data from the node to which the new data is to be written, a copy of the old parity, and a synchronization state indicator. The parity node determines new parity and transmits the new data to the data node for storage. Upon receiving an acknowledgement, the parity node resets the synchronization indicator.

When power-up occurs, after a power failure, the parity node scans its NVRAM for any entry and upon finding one with a non-reset state indicator, transmits the new data to a destination data node for entry thereby synchronizing the contents of data and parity nodes. In a mirrored system, NVRAM in only one node has a data identifier entered into its NVRAM so that, upon a power failure and subsequent power-up, that entry enables the system to know which disk drives are in a non-synchronized state, and to cause actions that result in re-synchronization.

13 Claims, 6 Drawing figures

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L34: Entry 150 of 153 File: USPT Jan 30, 1996

DOCUMENT-IDENTIFIER: US 5488731 A
TITLE: Synchronization method for loosely coupled arrays of redundant disk drives

Abstract Text (1):
A multiprocessor system includes a plurality of substantially identical nodes interconnected through a switching network, each node including a disk drive, NVRAM, and a processor. The system stores data in either a RAID or mirrored fashion across a plurality of disk drives in different nodes. When data is stored in a RAID arrangement, an NVRAM in a parity node is provided with an entry including the new data, a copy of old data from the node to which the new data is to be written, a copy of the old parity, and a synchronization state indicator. The parity node determines new parity and transmits the new data to the data node for storage. Upon receiving an acknowledgement, the parity node resets the synchronization indicator. When power-up occurs, after a power failure, the parity node scans its NVRAM for any entry and upon finding one with a non-reset state indicator, transmits the new data to a destination data node for entry thereby synchronizing the contents of data and parity nodes. In a mirrored system, NVRAM in only one node has a data identifier entered into its NVRAM so that, upon a power failure and subsequent power-up, that entry enables the system to know which disk drives are in a non-synchronized state, and to cause actions that result in re-synchronization.

Brief Summary Text (9):
The problem becomes more complex in architectures wherein multiple disks are written asynchronously, typically by separate controllers which can reside on separate processing nodes that are connected by a communication network. Where such disks are used for transaction processing systems, the prior art has made provision for using high level software transactions logs to enable resynchronization of the various disks, following a system failure.

Brief Summary Text (21):
A multiprocessor system includes a plurality of substantially identical nodes interconnected through a switching network, each node including a disk drive, NVRAM, and a processor. The system stores data in either a parity protected RAID or mirrored fashion across a plurality of disk drives in different nodes. When data is stored in a RAID arrangement, an NVRAM in a parity node is provided with an entry including the new data, a copy of the new parity, and a synchronization state indicator. The parity node determines new parity and transmits the new data to the data node for storage. Upon receiving an acknowledgement, the parity node resets the synchronization indicator. When power-up occurs, after a power failure, the parity node scans its NVRAM for any entry and upon finding one with a non-reset state indicator, transmits the new data to the destination data node for entry. In a mirrored system, NVRAM in only one node has a data identifier entered into its NVRAM so that, upon a power failure and subsequent power-up, that entry enables the system to know which disk drives are in a non-synchronized state.

Drawing Description Text (3):
FIG. 2 is a flow diagram indicating the procedures followed by the system of FIG. 1, in the case of mirrored-redundant data distribution.

Drawing Description Text (4):

h e b b g e e e f c e h e g

FIG. 3 is a flow diagram of the procedure followed by the system of FIG. 1 subsequent to a power-up in a mirrored data redundancy arrangement.

Detailed Description Text (2):
Referring to FIG. 1, a multiprocessor system 10 comprises a plurality of nodes 12, each of which is substantially identical, all such nodes interconnected via a switch network 14. Each node 12 includes a disk drive 16, a processor 18, RAM 20 and an NVRAM 22. Processor 18, in the known manner, controls the operation disk drive 16, RAM 20, and NVRAM 22. The operation of system 10 is controlled by one or more nodal processors 18. The processor(s) may be located at a central controlling node, (e.g. node 24) or may be distributed throughout the nodal structure. Each node 12 must be accessible to a controlling node by means of switching network 14. Thus, any controlling node attempting to read or write a disk block must be in direct contact with all nodes in a parity group storing the block. In the alternative, the controlling node that attempts to read or write a disk block must be in contact with one of the disk nodes in the parity group, and the nodes in the parity group must be fully interconnected.

CLAIMS:

1. A multiprocessor system including a plurality of substantially identical nodes interconnected through a switch network, each node comprising disk drive means, nonvolatile random access memory (NVRAM) and a processor, said multiprocessor system storing RAID-structured data across disk drive means in a plurality of different nodes, said system performing a method comprising the steps of:

a. listing at least an identifier of a data segment to be updated by received update data in an NVRAM in a first node in response to a command to write said update data to said data segment;

b. sending said update data from said first node to a second node containing a copy of said data segment;

c. removing said listing of said identifier in said NVRAM in said first node only when said update data is written to disk drive means in said first node and after receiving a signal that said second node has recorded said update data;

d. causing each node, in the event of a power-up, to scan its NVRAM to find any listed identifiers of data segments contained therein; and

e. for any data segment denoted by a listed identifier in said NVRAM in said first node, causing a corresponding data segment in said second node to be in synchronism with said data segment denoted by said listed identifier in NVRAM in said first node.

7. A multiprocessor system including a plurality of substantially identical nodes interconnected through a switch network, each node comprising disk drive means, a nonvolatile random access memory (NVRAM) and a processor, said multiprocessor system storing RAID-structured data across disk drive means in a plurality of different nodes, said system performing a method comprising the steps of:

responding to a command to write new data to replace old data in a data segment stored in a first node, by storing in NVRAM in a different node which stores parity data corresponding to old data stored in said first node, an entry comprising said new data, a state indication, and a copy of new parity as calculated based upon an exclusive-or combination of old data from said first node, old parity from said different node and said new data;

transmitting said new data to said first node for storage therein, and upon receiving a signal acknowledging successful storage, causing said different-node to

reset said state indication; and

causing said different node, in the event of a power-up to scan its NVRAM for a said entry, and upon finding a said entry with a non-reset state indication, transmitting said new data to said first node.

12. A multiprocessor system including a plurality of substantially identical nodes interconnected through a switch network, each node comprising disk drive means, nonvolatile random access memory (NVRAM) and a processor, said multiprocessor'system storing RAID-structured data across a disk drive means in a plurality of different nodes, said system comprising:

means for listing at least an identifier of a data segment to be updated by update data in an NVRAM in a first node in response to a command to write said update data to said data segment in said first node;

means for sending said update data from said first node to a second node containing a copy of said data segment;

means for removing said listing of said data segment in said NVRAM in said first node only when said update data is written to disk drive means in said first node and after receiving a signal that said second node has recorded said update data;

means for causing each node, in the event of a power-up, to scan its NVRAM to find any listed identifiers of data segments contained therein; and

means, responsive to finding a data segment identifier listed in said NVRAM in said first node, for causing a corresponding data segment in said second node to be in synchronism with said data segment listed in said NVRAM in said first node.

13. A multiprocessor system including a plurality of substantially identical nodes interconnected through a switch network, each node comprising disk drive means, a nonvolatile random access memory (NVRAM) and a processor, said multiprocessor system storing RAID-structured data across disk drive means in a plurality of different nodes, said system comprising:

means for responding to a command to write new data to replace old data in a data segment stored in a first node, by storing in NVRAM in a parity node which stores parity data corresponding to data stored in said first node, an entry comprising said new data, a state indication, and a copy of new parity as calculated based upon an exclusive-or combination of old data from said first node, old parity from said parity node and said new data;

means for transmitting said new data to said first node for storage therein, and upon receiving a signal acknowledging successful storage, causing said parity node to reset said state indication; and

means for causing said parity node, in the event of a power-up to scan its NVRAM for a said entry, and upon finding a said entry with a non-reset state indication, to transmit said new data to said first node.

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INVENTOR-INFORMATION:

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PRIOR-ART-DISCLOSED:

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Search Selected Search ALL Clear

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ABSTRACT:

This invention makes it possible for a customer computer to connect to an online service provider computer by phone, Internet, or other method, pay a fee to said service provider, and obtain additional processing and storage resources for the customer's computer. The resources can take the form of virtual storage and processing capabilities. These capabilities give the customer computer what appears to be additional local processing power and/or additional local storage, this storage possibly including preloaded software and/or data.

The additional resources made available to the customer computer can be used either to enhance the customers' local needs (such as access to virtual storage for additional disk space, or access to a more powerful processor of similar type for program execution), or these additional resources can be used by the customer computer to support services on-line that otherwise would be unavailable, impractical, or unaffordable. Examples of services include software and information rental, sales, and release update services, anti-viral services, backup and recovery services, and diagnostic and repair services, to name a few.

27 Claims, 68 Drawing figures